

Claims

What is claimed is:

1. A method of simultaneously detecting ~~and distinguishing~~ a plurality of different ^{functional} antibodies comprising,

(a) combining a sample containing a first plurality of different antigens, complement and effector cells, wherein the antigens are differentially labeled by a plurality of different fluorescent molecules,

(b) incubating the sample to allow for internalization of the antigens by the effector cells, and

(c) detecting internalized antigens using a flow cytometer, wherein an increase in fluorescence as compared to a control sample indicates the presence of internalized antigens and the functional antibody.

2. The method of Claim 1, wherein each member of the first plurality of different fluorescent molecules differs from each other member of the plurality in its fluorescence emission wavelength.

3. The method of Claim 1, wherein each member of the first plurality of different fluorescent molecules differs from each other member of the plurality in its fluorescence intensity.

(4) The method of Claim 1, wherein each member of the first plurality of different antigens comprises a bacterial molecule ^{derived} from a different serotype of a single bacterial species.

5. The method of Claim 4, wherein the bacterial species is *Streptococcus pneumoniae*.

6. The method of Claim 4, wherein the bacterial species is *Neisseria meningitidis*.

7. The method of Claim 4, wherein the bacterial molecule is an intact bacterium.

8. The method of Claim 7, wherein the intact bacterium is not viable.

9. The method of Claim 1, wherein the sample is taken from a body fluid or tissue of an individual.

10. The method of Claim 9, wherein the individual has been immunized with a vaccine containing a second plurality of different antigens, wherein the antigens are not labeled with fluorescent molecules but are otherwise the same as the first plurality of antigens.

11. The method of Claim 10, wherein the detection of the functional antibody indicates the efficacy of the vaccine.

12. The method of Claim 1, wherein the complement is freeze dried baby rabbit serum.

13. A method of simultaneously detecting and distinguishing a plurality of different functional antibodies comprising,

(a) combining a sample containing a first plurality of different antigens attached to different fluorescently labeled beads, complement and effector cells,

(b) incubating the sample to allow for internalization of the fluorescently labeled beads by the effector cells, and

(c) detecting the internalized beads using a flow cytometer, wherein an increase in fluorescence as compared to a control sample indicates the presence of internalized beads and functional antibody.

14. The method of Claim 13, wherein each member of the plurality of different antigens attached to different fluorescently

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labeled beads differs from each other member of the plurality in its fluorescence emission wavelength.

5 15. The method of Claim 13, wherein each member of the plurality of different antigens attached to different fluorescently labeled beads differs from each other member of the plurality in its fluorescence intensity.

10 16. The method of Claim 13, wherein each member of the first plurality of different antigens comprises a bacterial molecule derived from a different serotype of a single bacterial species.

15 17. The method of Claim 16, wherein the bacterial species is *Streptococcus pneumoniae*.

18. The method of Claim 16, wherein the bacterial species is *Neisseria meningitidis*.

20 19. The method of Claim 13, wherein the sample is taken from a body fluid or tissue of an individual.

25 20. The method of Claim 19, wherein the individual has been immunized with a vaccine containing a second plurality of different antigens, wherein the antigens are not labeled with fluorescent molecules but are otherwise the same as the first plurality of antigens.

30 21. The method of Claim 20, wherein the detection of the functional antibody indicates the efficacy of the vaccine.

22. A method of simultaneously detecting and distinguishing a plurality of different functional antibodies comprising,

(a) combining a sample containing a first plurality of different antigens, complement and effector cells, wherein the

antigens are differentially labeled by a plurality of different fluorescent molecules,

(b) incubating the sample to allow for internalization of the antigens by the effector cells, and

5 ✓(c) detecting internalized antigens using a standard hematology unit, wherein an a change in volume, conductivity, or scatter as compared to a control sample indicates the presence of
→ internalized antigens and the functional antibody.

10 23. A method of simultaneously detecting and distinguishing a plurality of different functional antibodies comprising,

(a) combining a sample containing a first plurality of different antigens attached to different fluorescently labeled beads, complement and effector cells,

15 (b) incubating the sample to allow for internalization of the fluorescently labeled beads by the effector cells, and

(c) detecting the internalized beads using a particle concentration immunofluorescent analyzer, wherein an increase in fluorescence as compared to a control sample indicates the presence
20 of internalized beads and functional antibody.

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